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Spin-flip conductance and magnetoresistance of magnetic nanocontacts

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Abstract

The quantized conductance of nanocontacts with atomic sizes is calculated with allowance made for the conduction-electron spin flip in terms of the quantum scattering theory. The exact solution of the Schrödinger equation describing the electron motion in a piecewise-smooth potential is used as the zeroth-order approximation of the perturbation theory. The probabilities of electron transmission (reflection) through a magnetic domain wall, as well as the spin-conserving and spin-flip conductances of the nanocontact, are calculated. It is demonstrated that the spin-flip conductance imposes the natural limitation on the formally infinite increase in the ballistic magnetoresistance of the nanocontact when its cross-sectional area tends to zero.

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